

ENVIRONMENTAL ASSESSMENT
OF THE
OPERATION AND MAINTENANCE
OF
TULLY LAKE
EAST BRANCH TULLY RIVER
ROYALSTON & ATHOL, MASSACHUSETTS

Prepared by



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

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Preface

The purpose of this Environmental Assessment is to provide the basis for evaluation of the environmental impact on the project area due to the routine operation and maintenance of this flood control reservoir. Tully Lake has been operated whenever necessary since it was constructed to prevent or reduce downstream flooding. Maintenance and management of the project, including the recreation facilities, during non-flood periods is also of primary importance. Enhancement of the fish and wildlife resources as well as protection of the environment within and around the reservoir area has been given careful consideration.

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I. PROJECT DESCRIPTION

A. INTRODUCTION

1. Location and Authorization

Tully Lake is located in the East Branch of the Tully River in the southwest corner of the town of Royalston, 3.5 miles north of Athol, Massachusetts. The reservoir area at spillway crest lies almost entirely in Royalston and Athol in Worcester County, Massachusetts, with a small portion extending into the town of Orange, in Franklin County, Massachusetts.

The project was authorized by the Flood Control Act approved 22 June 1936 (Public Law No. 738, 75th Congress), as amended by Public Law No. 111, 75th Congress, approved 25 May 1937 and further amended by Public Law no. 761, 75th Congress, approved 28 June 1938. Construction of the dam and associated works began in March 1947. The project became operational in January of 1949 and was completed in September 1949. Authorization for inclusion of a 300-acre summer conservation lake was requested by the Corps of Engineers in a letter dated 18 May 1964. Approval was given by the Chief of Engineers on 15 July 1964.

2. Purpose

Tully Lake is operated in close coordination with the Birch Hill Dam on the Millers River to provide flood protection for Athol, Orange, and other communities on the Millers River. As units in the comprehensive plan of flood protection in the Connecticut River Basin, their operation also aids in reducing flood stages at damage centers along the Connecticut River below the mouth of the Millers River.

B. STRUCTURES AND RESERVOIR

1. Dam

Tully Dam consists of a rolled-earth fill embankment with an impervious core and rock slope protection. The dam is 1,570 feet long with a maximum height of 62 feet above the stream bed. The top of the dam, at elevation 684.0 feet above mean sea level (msl), is 30 feet wide and accommodates an access road 20 feet wide along the length of the embankment. It provides 10.8 feet of spillway surcharge and 5.2 feet of freeboard. The embankment slopes vary from 1 on 2.5 to 1 on 8.

2. Spillway

The single spillway is located in a saddle about 800 feet southeast of the left abutment of the dam. The low 255-foot long uncontrolled ogee weir provides a spillway crest elevation at 668 feet msl. The chute type discharge channel is 1,775 feet long.

3. Outlet Works

The outlet works, located at the left abutment of the dam, consist of an intake channel 50 feet long, a gate structure with gatehouse directly above, a 6-foot inside diameter concrete tunnel 243 feet long through rock, and an outlet channel 580 feet long. The outlet works are controlled by two gear driven slide gates, each 3-feet 6-inches wide by 6-feet high and electrically operated from the gatehouse above. A replacement gate, for emergency purposes, is held in reserve and may be manually engaged and operated with the use of an on-site crane. In case of electrical failure, a gasoline-fueled generator can supply the power necessary to move the gates.

4. Reservoir

Tully Lake, when filled to spillway crest elevation, will inundate 1,130 acres of land along the East Branch of the Tully River, and have a storage capacity of 22,000 acre-feet, equivalent to 8.3 inches of runoff from the drainage area of 50.4 square miles. Of the storage capacity available, 20,500 acre-feet is allocated to flood control. In the summer, roughly from April to September, a 1,500 acre-foot recreation lake is maintained. This summer lake, which includes Long Pond, has a water surface area of 300 acres and a shoreline of six miles and corresponds to a stage of 16 feet. A smaller winter pool is maintained from October to March at a stage of 10 feet. The winter pool holds 525 acre-feet of water and covers an area of 78 acres.

Tully Lake was designed to allow for raising of the structure at some future time if the capability for power storage was desired. A project to raise the structure 35 feet in conjunction with a power development of the Millers River watershed was proposed in 1939, but not acted upon.

5. Real Estate

The project consists of 1300 acres owned in fee by the federal Government and 4 acres of flowage easement. The Commonwealth of Massachusetts has a license from the Federal Government for management of the recreation, fish and wildlife, and forestry resources of the reservoir.

C. OPERATION PROCEDURES

1. General Considerations

Generally, one of the major operating constraints on discharges from both the Tully Lake and Birch Hill Dams is created by the

Morton Meadows Housing Development for the elderly, located on the Millers River flood plain approximately one-quarter mile downstream of the Main Street bridge in Athol. Prior to the development's construction in 1958, the safe channel capacity at the Main Street bridge was measured at a stage of 4.0 feet. Since then, the safe capacity has been at 3.3 feet, or about 3,100 cubic feet per second (cfs).

Because Tully Lake has a storage capacity equivalent to 8.3 inches of runoff (drainage area = 50 sq. mi.) compared to 5.3 inches at Birch Hill (drainage area = 175 sq. mi.), its storage can be utilized sooner and to a greater degree than that of Birch Hill. This allows the two dams to be operated in such a way as to minimize the inundation of the major recreational facilities surrounding Lake Denison in the Birch Hill project area. It should be noted that the addition of a primitive camping and picnic area is presently being contemplated for Tully Lake. The location of these facilities, when built, will determine whether the aforementioned operating policy should be modified to lessen similar recreation maintenance problems at Tully Lake.

2. Flood Periods

Regulation of flows from Tully Lake and Birch Hill Dam is initiated at times of heavy rainfall over the Millers River watershed and also when specific river stages are reached at key index stations on the Millers and Connecticut Rivers. Regulation may be considered in three phases during the course of a flood:

Phase I, the appraisal of storm and river conditions during the development of a flood, and leading to initial regulation, Phase II,

regulation during and after crest of the Millers and/or Connecticut River flood flows: and Phase III, emptying the reservoir following the downstream recession of the flood.

The Tully Lake project manager maintains periodic radio contact with RCC during all phases of a flood operation. Secondary telephone connection is available if radio contact should be broken. In case all contact with RCC is lost, the project manager follows very conservative Emergency Operation Procedures (EOP) until communications can be reestablished.

D. MANAGEMENT PROGRAMS

1. Recreation

The Massachusetts Department of Natural Resources (DNR) has a license for management of the recreation, fish and wildlife, and forestry resources covering 1150 acres of land and water upstream of the dam. The remaining 150 acres, or 12 percent of the fee-owned project land, in the vicinity of the dam is reserved for project operation. The license was issued on 6 September 1955. Presently there are few developed recreation facilities. Two small picnic areas, a boat launching ramp and a number of narrow access roads and trails serve visitors to the reservoir area. This lack of facilities prohibits concentrated use of the area, but adds to the rustic beauty of the surroundings for those who do visit.

The Corps of Engineers and the DNR are currently preparing plans to develop primitive camping and hiking areas at the project. These plans are essentially a revision of the 1965 Master Plan for Reservoir Development, which has not been implemented to date.

2. Forestry, Fish and Wildlife

The Massachusetts Department of Natural Resources (DNR) has carried out a forest improvement program on reservoir lands with the intent to improve cover for recreational uses. This program includes type surveys, pruning, thinning and selective harvest cuttings. Several trails and roads have been kept cleared for public use and fire control purposes. Water holes have been developed for fire control.

No private timber harvesting is conducted in the reservoir area. Any trees cut are generally utilized by the DNR for making signs or other improvements.

The Division of Fisheries and Game stocks the Tully River and Lawrence Brook annually with brook, brown and rainbow trout. Tully Lake is a popular fishing spot for various species of game fish. Hunting of birds and small animals as well as deer is common in the project area.

The extension of the state's fish and wildlife management program at Birch Hill Dam to Tully Lake is possible in the future.

II. ENVIRONMENTAL SETTING

A. DESCRIPTION OF GENERAL AREA

1. Climate and Precipitation

The climate around the Tully Lake area is controlled in general by the prevailing westerly winds, which are predominantly northwesterly in winter and southwesterly in summer. Hurricane-intensity winds have struck the area fewer than ten times since 1900. However, thunderstorms and some hailstorms occur 10 to 20 times a year between

mid-spring and early fall.

The average annual temperature for the area is about 47°F., July being the warmest month and January the coldest. The mean dates of the last frost in the spring and the first frost in the fall are April 15th and November 15th, respectively. The average growing season is 153 days.

Precipitation is fairly uniform throughout the year, averaging about 42 inches annually. Mean annual snowfall is about 50 inches. Measureable precipitation falls on an average of one day out of three.

2. Topography

The topography of the area is characterized by gradual to abruptly rising hills and ridges, and valleys often containing marshes and swamps. Elevations in the project area range from about 600 feet msl to 1000 feet msl or more at the tops of surrounding hills. Peaks and ridges often rise 200 to 300 feet above the valley floors. The reservoir area itself is a small valley varying in width from about three-fourths of a mile near the dam to one-fourth of a mile in the vicinity of Long Pond. To the east is the steeply rising ridge of which Jacob Hill is a part. To the west are scattered peaks and associated marshy valleys. The impoundment area is relatively flat with a few scattered hills which become islands when the water rises behind the dam. Maximum elevations on the fee-owned property are just above the elevation of the top of the dam, 684 feet msl.

3. Vegetative Cover Types

Large parts of the surrounding towns of Royalston and Athol

are forested with agriculture playing a minor role in land use.

Forty-one percent of the land area at Tully Lake is occupied by Long Pond, the East Branch of the Tully River or by swampland. Only two percent of the total acreage at Tully Lake is open or pasture land. In the past, logging has occurred on what are now reservoir grounds. Consequently, the woods are predominantly comprised of medium to small sized trees with areas of scrub growth. The forest cover presently is about 50 percent evergreen, mainly hemlock and white pine, with the remainder a mixture of medium-tolerance hardwoods. A strip of land amounting to 227 acres surrounding the winter pool is kept cleared of trees and brush to enhance the conservation lake in the summer.

4. Fish and Wildlife Species Present

Sections of the East Branch of the Tully River and its tributary Lawrence Brook are stocked annually with brook, brown and rainbow trout. Long Pond and the conservation lake support warm water species, among them pickerel, white perch and yellow perch.

Game animals present at Tully Lake are cottontail rabbit, varying hare, gray squirrel, raccoon and white-tailed deer. Game birds and waterfowl include woodcock, ruffed grouse, black duck, mallard duck, and less frequently, Canada geese.

Beavers, otters, muskrats and red and gray foxes inhabit the project area and are sought by a few trappers. A few bobcats have been observed in the area and infrequently, black bear are spotted in or around the project. At the nearby Birch Hill wildlife management area, over 100 species of birds in fourteen different taxonomical

orders were observed by a local ornithologist. Several species of smaller mammals, such as red squirrels, chipmunks, woodchucks, skunks and opossum can also be found in the reservoir area.

5. Geological Features

The topography of the region which includes Tully Lake is largely controlled by structure and form of the underlying igneous and metamorphic bedrock. The Tully River, as do many of the watercourses in the area, follows the general north-south structural trends in the bedrock. The Millers River, flowing west, is the exception to this rule.

Glaciation has modified the bedrock formations by scour and by deposition of glacial debris. Pockets of glacial till composed of poorly sorted silt, sand, pebbles and boulders are interspersed throughout the area. This glacial till deposited directly by the ice is present on the crests and upper slopes of the hills but is thickest on the lower slopes and in the valleys. Overlying the till in the valleys are extensive glacial outwash deposits of sands and gravels in kame formations and ice-channel fillings. The stream bed of the East Branch of the Tully River consists primarily of these glaciofluvial deposits of sand and gravels.

6. Socioeconomic Conditions

The population in the general vicinity of Tully Lake is mostly rural and widely scattered. Approximately 37,000 people live within a 10-mile radius of the project. The population of the nearby town of Athol dropped from 11,637 in 1960 to 11,185 in 1970, a decline of

3.9 percent, according to census data. Royalston, the town in which most of the reservoir lies, is experiencing slight growth. In 1970, its population was 817.

As might be anticipated, the residents of nearby towns are the most frequent users of the recreational resources at Tully Lake. Recently, canoe races sponsored by a local sporting goods merchant were held on the conservation lake. As the population of the north-eastern United States continues to grow, and outdoor activities increase in popularity, outdoor settings such as Tully Lake will continue to be in demand by both local and out-of-town recreationists.

Industry in Athol is diversified: eight manufacturing firms employing 50 persons or more exist in the town. The largest firms on the basis of employment are the L.C. Starrett Tool Co., and the Union Twist Drill Corporation, both of which manufacture tools and machine tool accessories.

Several industries are located close to or directly on the Millers River to the extent that its natural hydraulic efficiency during time of flood is restricted. In the September 1938 flood, the Athol Manufacturing Company and L.C. Starret Tool Company, both of which have dams across the river, were badly damaged. In Orange, the construction of the riverway by New Home Dam caused severe flooding of the associated industrial buildings. In addition, many bridges, roads, residences and commercial establishments were flooded. The flooding experienced and the threat of future economic losses led to the authorization and construction of both Tully Lake

and Birch Hill Dam. With the results of these previous floods in mind only limited additional development has taken place in the Millers River flood plain below the project.

Highway access to Tully Lake is excellent from all sections of New England and eastern New York State. U.S. Route 202 traveling east-west and Massachusetts Route 32 running north-south provide access to the project.

III. ENVIRONMENTAL IMPACT OF THE OPERATION, MAINTENANCE AND MANAGEMENT PROGRAM

A. OPERATION FOR AUTHORIZED PURPOSES

1. Downstream Effects - Regulation of Flows and Releases

a. Flooding Prevented

Evidence of the importance of the flood protection provided by Tully Lake may be seen by the number of significant flood control operations which have taken place since the beginning of operations in January 1949 through July 1973. In 42 instances the pool stage has equalled or exceeded 14.3 feet (639.3 feet msl, about 5 percent of the total storage capacity). Significant operations have occurred at least once in every month of the year except September.

It is estimated that the reservoir has prevented over \$1,700,000 in damages thus far. The largest operation in terms of storage utilized occurred in April 1960 when a stage of 32.3 feet was reached, representing 51 percent of the reservoir capacity. In a recurrence of the basin flood of record, that of March 1936, the combined operation of Birch Hill Dam and Tully Lake would prevent over \$14,000,000 in damages.

b. Fish and Wildlife

The East Branch of the Tully River and the combined waters of the Tully River below Tully Lake are of high quality, suitable for both warm and cold water fishing. Because water is never stored for an extended period, Tully Lake has no long-term effect on stream flows. It does, however, cause substantial short-term changes in flow. Since the reservoir is managed to provide the highest level of continuous flood protection, operating policy is formulated to impound water in periods of highest flow and then to release it as quickly as possible after the critical stage is past, restoring flood control capabilities. During flood regulation and releases, flows in the East Branch of the Tully River are not as high as those which would have occurred were regulation at Tully Lake not present.

In addition to flood regulation, Tully Lake operations include seasonal impoundment and release of water associated with the summer and winter recreation pools. The impoundment of water for recreation occurs in the late spring during periods of high flow. If the lake is filled too rapidly, unnaturally low flows downstream of the dam could temporarily disrupt fish and other aquatic life in the shallows near the edge of the river.

Of greater consequence are reservoir operations affecting river discharge during dry months. The tendency to avoid making small, frequent gate changes to maintain both a stable conservation lake and natural outflow could cause potential environmental problems. The East Branch of the Tully River often dwindles to very low flow in the fall of the year, and daily flows of less than one cubic

foot per second are not uncommon. When flows are in this low range, a slight increase in lake stage due to increasing inflow may not warrant changing the gate setting, but outflow is being restricted to a value less than the inflow and the difference may have some effects on the downstream ecosystem.

c. Vegetative Cover and Timber

The East Branch Tully River downstream of the dam flows through a broad valley characterized by wetlands and associated vegetation in the low-lying areas. Flooding along this flood plain area has been reduced by the operation of Tully Lake, favoring the growth of more terrestrial plants and trees rather than the wetland types which were maintained by annual bank overflows prior to upstream regulation.

d. Water Quality

The East Branch of the Tully River is a good quality stream, relatively free from man-made pollutants. Its B classification indicates it is suitable for a water supply source with appropriate treatment. In addition to water quality samples collected by the Corps of Engineers' Water Quality Laboratory, streams in the area have been sampled intensively for the Millers River basin diversion study, part of the Northeastern United States Water Supply (NEWS) Study.

Bacteriologically, both the East Branch of the Tully River and Lawrence Brook show low numbers of fecal coliform, indicating little or no contamination from human wastes. Bacterial concentrations show seasonal variations, probably due to dilution effects of rainfall

Chemically, the water is low in alkalinity, hardness and total phosphorus. Chemical oxygen demand (COD) and ammonia nitrogen show marked seasonal variations. COD has varied from a low value of 12 milligrams per liter (mg/l) in late spring to a high of 35 mg/l in late summer. Analysis of samples taken at the inflow, in the impounded water, and at the reservoir discharge show very low biochemical oxygen demand (BOD) levels at each location, indicating the COD present was primarily from non biodegradable sources. Ammonia nitrogen has shown a high value of 1.4 mg/l in late summer. Interestingly, the periods of high COD and ammonia nitrogen corresponded with periods of high color content in the waters.

The East Branch of the Tully River and its tributary Lawrence Brook have a very high color content, in fact the highest of any streams in the Millers and Connecticut River watersheds. Seasonal variations are evident, but the water is deeply colored all year with lows in the range of 40 color units in the late spring and highs around 160 in the later summer. The brownish-red color is of natural origin. Tully Brook, as the East Branch of the Tully River is called in New Hampshire, drains considerable marshland and is the probable source of the organic, color-producing compounds.

The impoundment of waters in Tully Lake appears to have little effect on its quality. The only parameters noticeably affected are turbidity, which is lowered, and conductivity, which is raised.

2. Upstream Effects in the Reservoir

a. Fish and Wildlife

Since the reservoir bottom is quite flat and nearly level

throughout its length, impounded spring freshet flows rapidly spread over the project lands at lower elevations. The surface area of the reservoir increases nearly linearly with the rise in lake stage. Moderate rises in stage first flood the marshes around the summer and winter conservation lakes.

The warm water fish present in the lake (chain pickerel, bullheads, white and yellow perch, largemouth bass and sunfish) generally spawn close to the shoreline where the water is relatively shallow. When the water level rises due to flooding or in raising the conservation lake in the spring the fish eggs may be submerged in greater depths with resultant changes in environment. Many species of fish respond to a rise in water levels as a stimulus to trigger their spawning. This is true of both white and yellow perch. Because the conservation lake is a fairly small water body, raising and lowering the water level on a seasonal basis in addition to periodic flooding may well be beneficial for better growth and better sport fishing. In the spring, available food for aquatic life increases, and at the same time impoundment operations disperse fish, reducing competition and allowing faster growth. The same holds true in the summer when the summer conservation lake is maintained. In the winter when food supplies are less abundant, the lower pool concentrates warm water fish in a smaller area where more vigorous species survive the more competitive conditions. This could result in an overall improvement of fish populations, provided that fishing pressure is heavy enough to remove some of the larger game fish regularly.

The reaches of the East Branch of the Tully River and Lawrence Brook above Tully Lake are annually stocked with brook, brown and rainbow trout. The silt-cleansing action of spring freshet flows is important to the life cycle of salmonid species. However, the relatively flat gradients of these streams as they pass through the reservoir and their decreased velocities during flood control operations are not ideal for trout reproduction and limit the cold water sport fishing to a "put and take" proposition. The reservoir streams, except in the uppermost reaches, meet the temperature requirements of the Division of Fisheries and Game for trout waters (less than 70°F.) only through early June and in the fall of the year, further limiting the opportunity for natural propagation of the species.

Since Tully Lake has been in existence for over 15 years, the wildlife populations have undoubtedly stabilized and adapted to periodic flooding. The lake stage has equalled or exceeded 14.3 feet one or more times each year since construction, flooding about 150 acres of the reservoir area. Since the recent addition of the summer conservation lake, a reservoir operation using the amount of storage below a stage of 14.3 feet would, if it occurred when the summer conservation lake were maintained, flood an area of 600 acres.

The lowest lying areas are unsuitable as wildlife breeding habitat and the existing species have probably compensated for the inundation by moving further upland. The reservoir has never been more than 51 percent full, corresponding to an inundation of 70 percent

of the reservoir area. The fee-owned lands are only a small part of the woodlands in the surrounding area, and most species can escape from or avoid frequently flooded areas. Mink, otter, beaver, muskrat, and other semiaquatic animals have had less difficulty adjusting to flooding than have upland species. Some loss of fish and wildlife is unavoidable during severe flood conditions. There are no indications that fish or wildlife have suffered significant setbacks at Tully Lake due to reservoir construction or operation.

The reservoir's shape with its long irregular shoreline at all lake stages and the interspersed variety of vegetative cover types provide generally good habitat for wildlife, adding substantially to that which is available from woodlands surrounding the project area. The impoundment and recession of waters associated with the filling and releasing of the recreation lake probably have beneficial effects on the fishery by concentrating food supplies in the winter months and opening up larger spawning and feeding areas in the spring. Inundation of the conservation lake by impounded waters is probably somewhat disruptive to fish and wildlife in and around these waters, although fish and wildlife populations appear to have adapted to the altered environment in the years since the project became operational.

b. Vegetative Cover and Timber

The difference in land area between the summer and winter conservation pools represents a strip of land roughly circular in shape amounting to 227 acres. This strip was cleared of vegetation

in the spring of 1970 to avoid plant kill and decomposition while inundated by the summer recreation lake. When the lake is drawn down to its winter level, the area is left exposed and is barren except for some semiaquatic plants which can survive the alternate exposure and submergence. The major consequence of maintaining a summer lake is the elimination of acreage for development of woodland and wildlife habitat. The value of this land for vegetation and wildlife is limited in any case by the frequent flooding which would have continued from reservoir impoundment operations.

In addition to the area just mentioned, another 250-300 acres of bottom land above the summer lake elevation are flooded frequently, contributing to the shrubby wetland character of this portion of the reservoir area. Periodic inundation supports a growth of semi-aquatic weeds and small shrubs which provide food and cover for wildlife from surrounding areas. It also detracts from use of the grounds for wildlife nesting and breeding.

No substantial tree kills are noticeable at Tully Lake. Partial immersion for short periods is often not fatal to mature trees, although loss of lower branches may affect growth and the ability to withstand future flooding. Immature and smaller trees will suffer somewhat more since at a given elevation they are more likely to be entirely submerged than are taller trees.

c. Recreational Use

The Tully Lake project grounds are naturally attractive to

recreationists. The reservoir has limited facilities at two picnic areas, with a total of 10 tables and fireplaces, and a pit toilet. A major positive feature of the project is the good access available to remote parts of the reservoir via logging roads and other paths which put the hunting, fishing and other recreational opportunities within easy reach of the visiting public.

Historically, 13 percent of the significant reservoir operations have occurred in the months of April and May when trout fishing pressure is consistently the greatest. Besides limiting fishing accessibility during the early season, the State's stocking program could also be delayed by high water levels, thus adversely affecting fishing quality.

d. Aesthetics

The fringe area around the winter conservation pool, as discussed previously, is unattractive during the winter months when there is no snow on the ground. This strip, which amounts to 17 percent of the total project area, supports little plant life and has a muddy and barren appearance as a result of being submerged under the conservation lake for approximately half of the year. The unpleasant visual aspect is less significant, however, because project visitation is low during the winter months when the bottom area is exposed.

The picnic area near the spillway is situated on a former spoil area which is devoid of plant life and cover. It is thus not particularly aesthetically pleasing due to its surroundings.

B. CONSTRUCTION AND MAINTENANCE OF PROJECT FACILITIES

1. Recreational Facilities

The Massachusetts Department of Natural Resources, Division of Forests and Parks, is licensed to manage 1150 acres of land and water upstream of the dam. Recreational development thus far is limited to two small picnic areas, 1 boat launching lane, 60 parking spaces, and trails for fishing, hiking and snowmobile use in the winter, all managed by the Corps of Engineers. A 300-acre lake is maintained in the summer, with a smaller winter pool, to enhance fishing and boating. Nine access points into the project grounds and many easily traveled logging roads and paths make Tully ideal for hunters, fishermen and other outdoor enthusiasts.

The intensified development of additional facilities called for in the 1965 Master Plan for Reservoir Development has not been carried out at Tully Lake. Instead, the alternative of building primitive camping, hiking and boating facilities is being considered by the Corps of Engineers and the Massachusetts Department of Natural Resources. A revised Master Plan is presently being prepared.

a. Maintenance of Existing Facilities

Because of the lack of developed facilities, maintenance work by the Division of Forests and Parks is minimal. Most maintenance work is accomplished by the project manager as part of normal management of project grounds. Such duties consist mainly of routine repairs and maintenance of roadways, signs and trails and the ever present need to remove rubbish or litter from the picnicking and other heavily used areas.

Preservation of the pleasing natural character of the project lands is complicated, here as elsewhere, by the fact that users are a transient population. Due to the lack of central recreational facilities, use is not concentrated at Tully Lake as it is at projects having large camping and picnic areas. The boat launch and areas around the lake receive the most usage, and therefore, require close monitoring for possible abuse or necessary maintenance work. Maintenance of the shore and hiking areas is aimed primarily at correcting degradation from normal usage and natural occurrences to forestall adverse environmental effects. This involves close inspection of soil deficiencies, damaged trees and shrubs and erosion. Fire access roads and trails must be kept open and passable. Despite the problems involved in maintaining the area, the grounds are kept free from litter and visual disturbances to the natural environment. Public abuse and vandalism have not been widespread.

b. Construction of New Facilities

No action has been taken on the 1965 Master Plan for Tully Lake, partially to allow completion of water supply diversion studies which would affect decisions on the type, location and degree of compatible recreation development. The Corps of Engineers and the Department of Natural Resources are cooperatively making new plans, utilizing a different concept for public use of the project area. Rather than the construction of camp sites, sanitary facilities and relatively intensive improvements to recreational areas, thoughts

are now turning to construction of primitive camp sites for tent campers and maintenance of hiking and sightseeing trails for day users.

Presently, Tully Lake has the potential for either of the aforementioned development schemes. The proximity to large populations and a fine highway network assure heavy use of whatever facilities are built.

Primitive camping would take advantage of the project's most valuable resource, the unspoiled natural setting of forests and water areas. From environmental and aesthetic points of view, a plan for development which encourages public use without intensive construction is preferable. The primitive alternative may also be warranted as offering a contrasting recreation spot to other more developed areas such as nearby Birch Hill Dam where camping and day-use facilities are extensive. Recreationists would then be afforded a choice between the developed "park" atmosphere and the undeveloped woodland setting.

2. Weed and Brush Control

Some herbicides have been used at Tully Lake for control of noxious vegetation, such as poisonous plants. Brush is removed from pavement shoulders and from the sides of paths and trails. In semi-improved areas, weed and brush control is practiced around picnic areas, structures or where vegetation is a nuisance to recreationists or reservoir operation. In unimproved areas no controls are usually practiced, except at fire breaks and transmission line clearings.

C. MANAGEMENT OF PROJECT LANDS

1. Rules and Regulations

Management of the project lands for recreation is the responsibility of the Massachusetts Department of Natural Resources. The Massachusetts Division of Forests and Parks and the Division of Fisheries and Game have established rules and regulations which apply to Tully Lake. Fishing and hunting are regulated according to Massachusetts Fish and Game Laws. The rules and regulations have been drawn up to provide for the safety and enjoyment of the visiting public. Establishment of these standards and their enforcement when necessary have and will continue to protect the environmental values of the land leased for recreational management.

2. Fish and Wildlife Management

The stocking program of the Division of Fisheries and Game provides "put-and-take" fishing for brook, brown and rainbow trout in the East Branch of the Tully River, Lawrence Brook and Boyce Brook. These streams are stocked at 24 different locations upstream of the reservoir beginning at the New Hampshire-Massachusetts border and in 5 locations below the reservoir. Thus cold water fishing is available throughout the Tully Lake area.

No stocking of game animals takes place at Tully Lake. Nevertheless, hunting pressure is heavy on reservoir grounds during the fall hunting season. Persons familiar with the project grounds since the reservoir became operational claim a decline in the deer population in the area and a subsequent drop in deer taken. This may be due to the

gradual encroachment by man on deer breeding and feeding habitat.

3. Recreational Use and Management

The nature of the project grounds and lack of central facilities tend to make close supervision of the reservoir lands by management personnel impractical. As previously mentioned, rules have been established for public use by the Massachusetts DNR. The excellent condition of the grounds, however, is not due to these regulations as much as the responsibility felt by the individuals who use the project. The most effective management technique available to preserve the attractive environment is sensible development of facilities, education of the public to their role and the presence of a visible regulation and enforcement structure for public use of the project.

The Tully Lake project manager compiles monthly visitation records based on traffic counts in the vicinity of the dam and at both small picnic areas. No records are kept of recreational use in the general reservoir area as the numerous access roads are not amenable to control, and placement of counters on each is impractical. Visitation during the past ten years at the dam and picnic areas has averaged just over 20,000 annually, including sightseers, and has remained relatively constant throughout the period.

The area right around the dam presents no special management problems. There is no practical way to determine how many people visit the upstream reservoir area, but no significant trash or other management problems have been encountered.

4. Forestry Management

The Department of Natural Resources has, in past years, done some limited forest improvement work at Tully Lake, such as thinning and pruning. Any more intensive clearing or cutting operations would adversely affect the environmental quality of the area, as the timber resources are probably most valuable as wildlife cover and for aesthetic purposes rather than for lumber or other uses.

5. Pollution Control

Sanitary facilities are not subject to flooding, are adequate to treat and dispose of domestic wastes and conform to Article XI of the Massachusetts Sanitary Code, "Minimum Requirements for the Disposal of Sanitary Sewage in Unsewered Areas." As discussed previously, water quality records at Tully Lake indicate the tributary streams to be of excellent quality, subject only to high background levels of certain constituents.

IV. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED AS A RESULT OF THE OPERATION AND MAINTENANCE PROGRAM

A. FISH AND WILDLIFE - DOWNSTREAM CHANGES

Tully Lake is primarily a flood control reservoir with the additional feature of maintaining a conservation lake at different winter and summer levels. As such, the flow through the dam is equivalent to the natural discharge of the East Branch of the Tully River for most of the year.

The decreased duration and extent of inundation of the flood plain areas would alter streamside vegetation which provides food for fish and wildlife, as well as altering the ecological diversity and productivity of this zone. The direct effects of flow regulation

are felt most keenly along the 3.9 river miles of the Tully River above its junction with the Millers River where the flood plain is broad and somewhat swampy. Since Tully Lake is one of many flood control, as well as hydroelectric projects in the Connecticut River Basin, the environmental impact of its operations further downstream may be slight. However, the synchronous action of the flood control network in reducing flood flows and the superimposed diurnal flow fluctuations from power plants are known to have some effect on the spawning behavior of anadromous fish, although the exact relationship is uncertain.

B. FISH SPAWNING - WATER LEVEL FLUCTUATIONS AND DRAWDOWN

Changes in lake water levels may result in unavoidable disruption of the warm water species and their spawning patterns. During short periods of impoundment and drawdown, it is doubtful that many fish deposit their eggs in shallow areas. Longer inundations and subsequent drawdowns at critical times of the year may strand eggs or fry in dry areas which were previously shallows. Different species are affected differently by changes in water level. The lack of a warm water fisheries management program or study prevents an accurate determination of the overall impacts of reservoir operations on fish. As discussed in Section III.B.2.a, it is possible that the adverse effects on spawning could in certain instances be outweighed by more favorable competition and growth conditions for those fish species present.

C. WILDLIFE HABITAT - PERIODIC INUNDATION

Flood control operations at Tully Lake necessarily restrict the range and mobility of upland wildlife during impoundment. Without detailed studies, it is impossible to assess the impact of this loss of habitat or animal losses due to drowning.

D. VEGETATIVE COVER AND TIMBER - PERIODIC INUNDATION

Whenever flood waters are stored at Tully Lake for periods of several days or longer, some vegetation mortality can be expected. Frequent flooding can restrict growth to those plants tolerant of periodic flooding. Moreover, flooding prevents the takeover of bottomland brush and marshland by larger trees which in the absence of frequent flooding would gradually encroach on the unforested areas.

V. ALTERNATIVES TO THE OPERATION, MAINTENANCE AND MANAGEMENT PROGRAM

A. DISCONTINUANCE OF AUTHORIZED FLOOD CONTROL OPERATIONS

From social and economic viewpoints discontinuation of operations at Tully Lake would have severe repercussions. Prior to 1940, substantial development had occurred in Orange and Athol immediately adjacent to the river channel, necessitating the construction of Tully Lake and Birch Hill Dam. Were Tully Lake to cease operation the situation would revert to the preproject flood hazard insecurity, threatening those residing on the flood plain. The flood protection which Tully Lake affords as part of the comprehensive flood protection scheme is difficult to assess separately from the other reservoirs

involved. Estimated damages prevented since 1949 far exceed combined construction, operation and maintenance costs. This and the protection Tully helps provide for developments such as the Morton Meadows Housing for the Elderly insure that curtailing operations would have severe consequences downstream.

From an environmental perspective discontinuance of operations would likewise affect conditions both up and downstream. Since the project's construction in 1949, the plant, fish and animal life upstream have adapted to periodic inundation and are adapting to the presence of the conservation lake and higher flood pools. Downstream they have become accustomed to less frequent and less extensive flooding. Under a situation of discontinued operations, the ecosystem currently maintained would be disrupted.

Presently, there is no source of public water supply associated with Tully Lake. Two alternatives under investigation in the Millers River Basin as part of the Northeastern United States Water Supply Study (NEWS) involve diverting water from the East Branch Tully River for public water supply. In one case, no impoundment of water by Tully Lake is involved. The second alternative, known as the Tully Complex Diversion, would involve substantial modifications to the existing project with the summer conservation lake level raised seven feet and an additional 300 acres inundated.

B. LAND MANAGEMENT ALTERNATIVES

1. Discontinuance of Land Management Activities

The Massachusetts Department of Natural Resources holds a license for recreation management of the Federally owned land at Tully Lake.

Presently, the management practices are limited. The East Branch Tully River and Lawrence Brook are stocked with trout before and during the fishing season. The Division of Forests and Parks' rules and regulations for use of State outdoor areas lend some guidance, which would otherwise be lacking, for use of project lands by recreationists.

Maintenance work on project lands to remove flood debris, keep the lake shoreline clear, remove solid waste and keep access trails and roads open is essential to both flood control and recreational operations at Tully Lake.

In the absence of management programs, public use of the area would be unrestricted and the present capability for control and general supervision would be lost. The likelihood of further development of recreation facilities heightens the need to continue this management framework so that public safety and environmental quality can be ensured as recreational use increases.

2. Single Purpose Management of Lands

Tully Lake has been recognized as having two major assets for recreation use. Its natural beauty makes it a favorite scenic spot for persons who enjoy picnicking, boating, hiking, hunting, fishing and other day-use activities. Further, Tully Lake has the potential for recreational development as outlined in the 1965 Master Plan.

Adoption of single purpose management catering to any one group would entail less than optimum public benefit from the Tully Lake area. Recreation development to the exclusion of environmental values as well as the opposite situation is obviously neither a socially nor

environmentally desirable alternative.

3. Multiple Use Management

As far as is practicable from a flood control viewpoint, the Corps of Engineers has incorporated secondary recreation programs into its reservoir public use plans to help meet the demands for outdoor activities. The idea and practice of multiple use management is well established. Possible alternatives for improved multipurpose management include development of recreational facilities, already under consideration by the Corps of Engineers and the Department of Natural Resources, and management of wildlife areas.

A carefully administered program of developing scattered feed plots and fields might add to Tully Lake's value for wildlife habitat, improving the populations of both game and nongame animals. It must be realized, however, that clearing of new openings and fields alters the aesthetic character of the land. A program of seeding suitable feed and cover crops in existing cleared spaces and minimizing cutting and fertilizing might serve environmental interests best. The lack of statistics concerning hunting and fishing pressures at the project suggests that the Division of Fisheries and Game investigate these uses in the event that expansion of the Birch Hill wildlife management program to Tully Lake is considered justifiable in view of demand for these opportunities.

The recent upsurge of snowmobiling at Tully Lake suggests an instance in which the Department of Natural Resources may have to

adjust its management policies. The many wood roads and logging trails through the reservoir, most of which are not regularly plowed in the winter, are ideal routes for snowmobiles. The open hunting season for cottontail rabbits, snowshoe hares and jack rabbits extends into February and ruffed grouse may be hunted until early January, however, there have been no problems despite the possibility of these activities conflicting.

In summary, the management of Tully Lake for a number of unconflicting uses is socially and environmentally beneficial and will be continued. Specific difficulties as they arise will be addressed by the State and the Corps with careful regard to the impact that any change in management procedure would have on other programs within the reservoir.

C. CONSTRUCTION AND MAINTENANCE ALTERNATIVES

1. Development of Project Lands

The natural resources of the Tully Lake area make it a prime spot for development of recreational facilities. Environmentally, the optimum level of development may be relatively low. Hiking trails, picnicking facilities and boat ramps should be constructed and their use encouraged, but only to an extent which allows the public access while not creating management problems or infringing on the scenic qualities of the project.

In this case, the construction planning must be carefully done to adequately accommodate and encourage a specific number of recreationists. Limiting parking spaces, for example, discourages overflow crowds. Maximum enjoyment is guaranteed those who use the facilities,

while a continuing demand for more such areas should be allowed to lead to opening new ones, not overexpansion of existing facilities. Tully Lake, in this way, might serve the public's need for uncrowded outdoor areas instead of more comprehensive facilities as can be found elsewhere within relatively short driving distances.

No matter what development plan is finally implemented at Tully Lake, information is needed on the number of people who visit the general reservoir area and what activities they engage in. Such data would be especially useful to evaluate the demand for and use of natural areas where few facilities have been constructed.

D. CONSERVATION LAKE REGULATION ALTERNATIVES

1. Discontinuance of Conservation Lake

Prior to May 1971, Tully Lake was operated without the maintenance of a permanent conservation lake behind the dam. To enhance boating, fishing, scenic and other recreational qualities, a 300-acre summer lake is kept roughly during May through September by appropriate control of the outlet gates. For the rest of the year a smaller pool is held for fish and wildlife conservation reasons and to avoid freezing of the outlet gates.

The lake represents an attraction to wildlife, which obtain at least part of their food from aquatic and wetland vegetation. Fish populations as enhanced by the lake environment would, of course, decrease if the lake were not maintained. Boating and fishing opportunities would also be diminished and the aesthetic quality of the reservoir would probably be lowered. Most would agree that the lake is more attractive to the eye than is a barren flood basin.

Since the acreage covered by the recreation lake would be subject to flooding on an average of twice a year without the lake, the area is not likely to support much terrestrial plant life and would be essentially unusable by wildlife except as part of their range during non-flood periods.

Flood storage capacity would be increased by approximately 7 percent in the summer and 2.9 percent in the winter if no lake was maintained. It has been demonstrated that this loss in capacity is insignificant except in severe flood conditions. Historically, severe floods have not occurred in the summer months.

In summary, the conservation lake adds substantially to the recreation available at Tully Lake while causing little environmental harm, with the possible exception explored in the next alternative.

2. Maintenance of the Conservation Lake at a Constant Level Year Round

Advantages of this policy would be elimination of the impact associated with the changing of the lake stage between summer and winter levels. The "fringe" area corresponding to the difference between the land covered by the conservation lakes amounts to over 15 percent of the project land area. This zone is flooded in May by the summer conservation lake and exposed in September. From October to April it is barren, and the mud flats when not covered by snow, are aesthetically unattractive. The variation in lake levels may limit this area's productivity in terms of plant, fish and animal life. But, the variation in lake levels also may enhance game fish population as discussed more fully in Section III.A.2. above.

VI. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

A. SOCIOECONOMIC EFFECTS

1. Flood Control Benefits

The flood control projects initiated after the 1936 and 1938 floods in the Millers River basin, Tully Lake and Birch Hill Dam, were constructed to mitigate future flood damages. These projects afford a high degree of protection, yet little further development has occurred along the Millers River, creating a somewhat exceptional situation since in many localities flood plain land, once it has been afforded protection, is subject to intensive speculation and development.

The conflict between short-term uses and long-term effects occurs when the dams are built to provide protection essentially for existing buildings and properties while the incentive this gives to further development is not recognized. The original investment in structural flood control may be justified by savings in damages in a relatively short span of years as floods occur which would have caused destruction of downstream property. Cheap, easily developed land in this protected flood plain may sprout industries and residential areas which in turn necessitate tighter control on flood waters. Downstream communities may actually exceed the original flood protection limit which the projects were designed to provide. The drawback is that control of flood waters to the benefit of the developed flood plain will adversely affect the environment and ecology of the entire area both upstream and downstream of the dam.

For example, overdevelopment of flood plain lands may put a severe pollution burden on a river, which simultaneously may not be flowing full nor benefiting from the cleansing effects of spring flood flows due to impoundment operations. In view of the opportunities now for rational, farsighted land use planning in flood hazard areas, the presence of flood protection should not be used as a justification for development or for failure to preserve the flood plain.

Tully Lake, as part of the comprehensive plan for flood management on the Millers and Connecticut Rivers, has provided adequate protection to downstream communities and its protection limit has not been exceeded by economic development on the Millers River.

2. Recreational Benefits

Because Tully Lake has not yet been extensively developed for recreational use, decisions can be made concerning the direction the development will take in the years to come. In this case, short-term uses and long range productivity may be harmonious.

The size, shape and natural resources of the reservoir area may lend themselves best to "primitive" development, catering to tent campers, hiking and canoeing on a low density scale. The natural scenery and landscaping can be preserved if primitive facilities are used. From the very start, recreationists using Tully would benefit from the undisturbed forest lands and uncrowded open space. Furthermore, these same opportunities will be preserved for others to appreciate, especially at a time when public land and open space are increasingly being taken over by development and private interests.

B. BIOLOGICAL COMMUNITIES AND ECOSYSTEMS - CHANGES IN LAND USE

Development in Athol, Orange and other communities on the Millers River has not seriously encroached on the flood plain since the time of Tully Lake's construction. The adverse effects of paving, building or otherwise altering the natural flood plain and its storage capacity cannot easily be reversed once the flood plain is preempted for structural development. Therefore, the Tully and Millers River watershed communities have a singular opportunity to preserve those portions of the flood plain which are as yet relatively untouched. The establishment of channel encroachment lines, flood plain zoning and building codes related to construction in flood-prone areas are among the necessary prerequisites for protection of ecologically valuable lowlands. Massachusetts' Inland Wetlands Act has begun to protect the flood plains, but their preservation can no longer be left to chance. The biotic diversity in riverine environments is widely accepted as being important not only for aesthetic reasons, but also for the long term productivity of the ecosystem as it relates to man. Protection of fish and wildlife demands that strong long range measures be taken.

In the vicinity of the Tully Lake project itself, the ecosystem has basically stabilized and adjusted to periodic flooding upstream and flow regulation downstream. The management programs currently underway and those to be formulated should aim to prevent or mitigate any adverse environmental impacts arising from either reservoir operations or public use of the project.

VII. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH ARE INVOLVED IN THE OPERATION AND MAINTENANCE PROGRAM

A. LOSS OF NATURAL RESOURCES DUE TO PERIODIC FLOODING AND CONSERVATION LAKE REGULATION

At least 500 acres of bottom land in the reservoir along the East Branch Tully River have been committed to flooding on an average of twice a year. The result is that natural successional changes in vegetation, from brush swamp to eventually mature forest, have been eliminated for as long as Tully Lake continues in operation. Frequent spring flooding has rendered the same land undesirable for wildlife breeding habitat and some direct losses to small game and nongame species may occur.

Impoundment operations may prohibit access to some trout fishing waters in the spring and possibly affect the reproduction and survival of cold water game fish. The reproduction of warm water fish in the conservation lake is not entirely predictable and may vary from year to year, partly because of reservoir flood control operations, resulting in a quality of fishing that may be erratic.

VIII. COORDINATION WITH OTHER AGENCIES

Coordination with various Federal, State and local interests resulted in valuable input to this assessment. Both meetings and correspondence proved to be very helpful. Following is a list of the several interests with whom coordination took place:

Bureau of Sport Fisheries and Wildlife

Soil Conservation Service

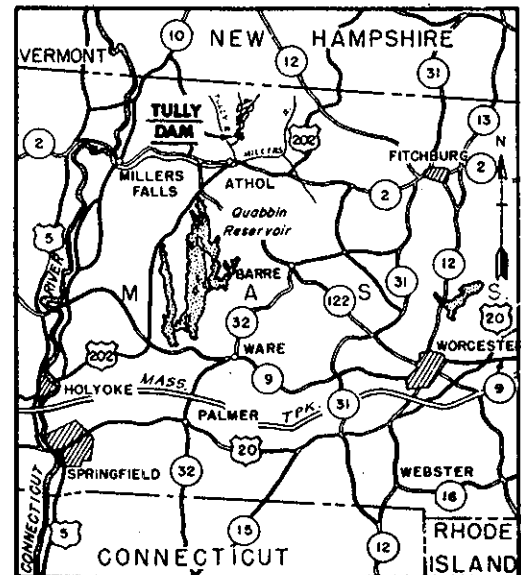
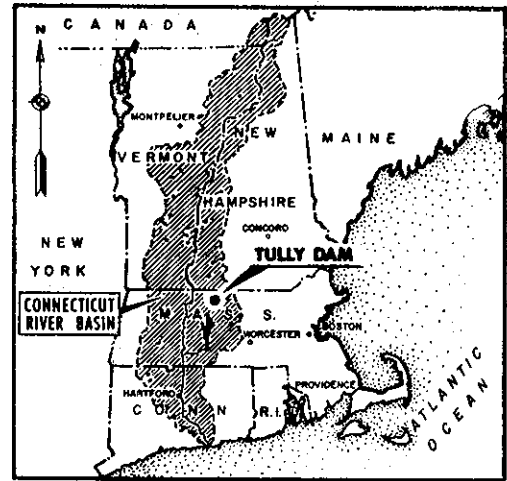
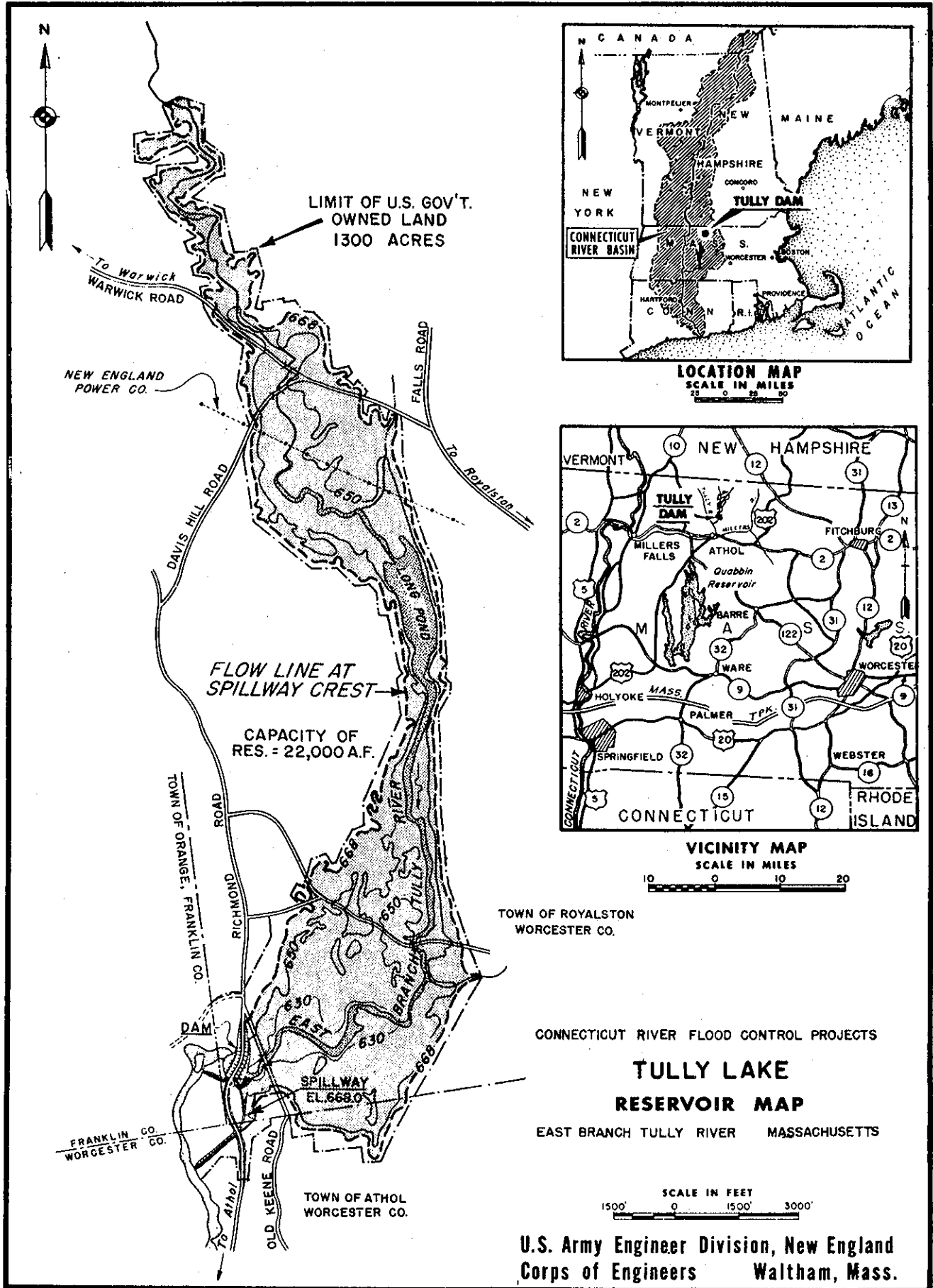
New England River Basins Commission

Massachusetts Division of Forests and Parks

Massachusetts Division of Fisheries and Game

Massachusetts Audubon Society

Millers River Watershed Council, Inc.



TOWN OF ROYALSTON
WORCESTER CO.

CONNECTICUT RIVER FLOOD CONTROL PROJECTS

TULLY LAKE RESERVOIR MAP

EAST BRANCH TULLY RIVER MASSACHUSETTS

U.S. Army Engineer Division, New England
Corps of Engineers Waltham, Mass.